

1. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{4x^3 + 4x^2 - 33x - 45}{6x^2 - x - 15}$$

- A. Vertical Asymptote of $x = 1.667$ and hole at $x = -1.5$
 - B. Vertical Asymptote of $x = 0.667$ and hole at $x = -1.5$
 - C. Vertical Asymptotes of $x = 1.667$ and $x = -1.5$ with no holes.
 - D. Vertical Asymptotes of $x = 1.667$ and $x = -2.5$ with a hole at $x = -1.5$
 - E. Holes at $x = 1.667$ and $x = -1.5$ with no vertical asymptotes.
-

2. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{12x^3 + 59x^2 + 29x - 60}{12x^2 + 35x + 25}$$

- A. Vertical Asymptote of $x = -1.25$ and hole at $x = -1.667$
 - B. Holes at $x = -1.25$ and $x = -1.667$ with no vertical asymptotes.
 - C. Vertical Asymptote of $x = 1.0$ and hole at $x = -1.667$
 - D. Vertical Asymptotes of $x = -1.25$ and $x = -1.667$ with no holes.
 - E. Vertical Asymptotes of $x = -1.25$ and $x = 0.75$ with a hole at $x = -1.667$
-

3. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{9x^3 - 15x^2 - 2x + 8}{6x^2 + 19x + 10}$$

- A. Vertical Asymptotes of $x = -2.5$ and $x = -0.667$ with no holes.
- B. Vertical Asymptotes of $x = -2.5$ and $x = 1.333$ with a hole at $x = -0.667$
- C. Vertical Asymptote of $x = 1.5$ and hole at $x = -0.667$

- D. Vertical Asymptote of $x = -2.5$ and hole at $x = -0.667$
 - E. Holes at $x = -2.5$ and $x = -0.667$ with no vertical asymptotes.
-

4. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{8x^3 - 2x^2 - 43x + 30}{6x^2 + 7x - 20}$$

- A. Holes at $x = 1.333$ and $x = -2.5$ with no vertical asymptotes.
 - B. Vertical Asymptote of $x = 1.333$ and hole at $x = -2.5$
 - C. Vertical Asymptote of $x = 1.333$ and hole at $x = -2.5$
 - D. Vertical Asymptotes of $x = 1.333$ and $x = 0.75$ with a hole at $x = -2.5$
 - E. Vertical Asymptotes of $x = 1.333$ and $x = -2.5$ with no holes.
-

5. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{8x^3 - 46x^2 + 85x - 50}{4x^2 + 7x - 15}$$

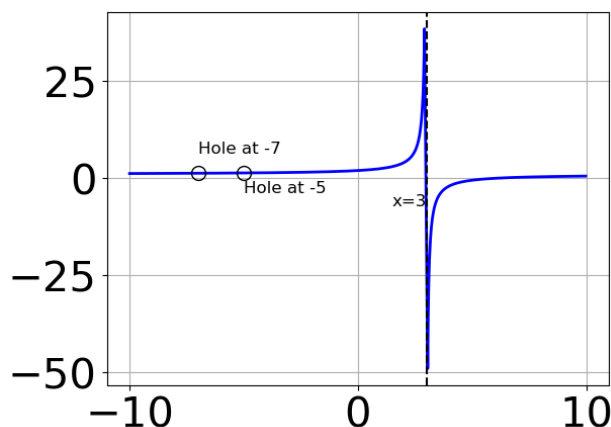
- A. Horizontal Asymptote of $y = -3.0$ and Oblique Asymptote of $y = 2x - 15$
 - B. Horizontal Asymptote of $y = 2.0$
 - C. Oblique Asymptote of $y = 2x - 15$.
 - D. Horizontal Asymptote of $y = 2.0$ and Oblique Asymptote of $y = 2x - 15$
 - E. Horizontal Asymptote at $y = -3.0$
-

6. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{12x^3 + 11x^2 - 45x - 50}{8x^3 + 28x^2 - 26x - 20}$$

- A. Horizontal Asymptote of $y = 0$
- B. Vertical Asymptote of $y = -1.000$
- C. None of the above
- D. Vertical Asymptote of $y = 2$
- E. Horizontal Asymptote of $y = 1.500$

7. Which of the following functions *could* be the graph below?



- A. $f(x) = \frac{x^3 + 9.0x^2 - 108.0}{x^3 - 9.0x^2 - x + 105.0}$
- B. $f(x) = \frac{x^3 + 3.0x^2 - 36.0x - 108.0}{x^3 + 9.0x^2 - x - 105.0}$
- C. $f(x) = \frac{x^3 + 6.0x^2 - 37.0x - 210.0}{x^3 + 9.0x^2 - x - 105.0}$
- D. $f(x) = \frac{x^3 - 6.0x^2 - 37.0x + 210.0}{x^3 - 9.0x^2 - x + 105.0}$
- E. None of the above are possible equations for the graph.

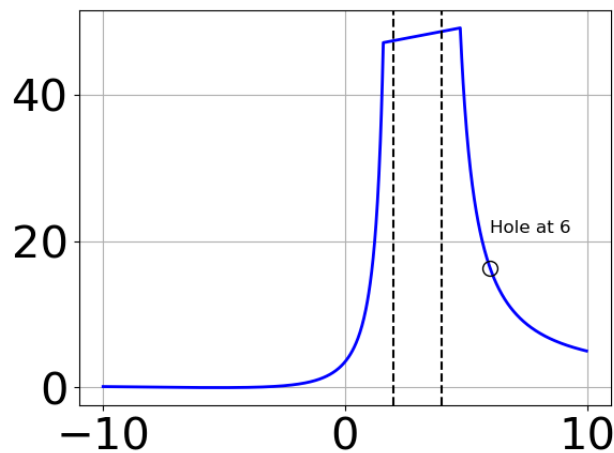
8. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{2x^2 - 3x - 9}{8x^3 + 22x^2 + 3x - 18}$$

- A. Horizontal Asymptote of $y = 0$
- B. Horizontal Asymptote at $y = 3.000$
- C. Horizontal Asymptote of $y = 0.250$ and Oblique Asymptote of $y = 4x + 17$
- D. Oblique Asymptote of $y = 4x + 17$.
- E. Horizontal Asymptote of $y = 0.250$

9. Which of the following functions *could* be the graph below?

$x=4$



$x=2$

A.
$$f(x) = \frac{x^3 + 5.0x^2 - 38.0x - 168.0}{x^3 - 12.0x^2 + 44.0x - 48.0}$$

- B. $f(x) = \frac{x^3 - 5.0x^2 - 38.0x + 168.0}{x^3 + 12.0x^2 + 44.0x + 48.0}$
- C. $f(x) = \frac{x^3 - 4.0x^2 - 49.0x + 196.0}{x^3 + 12.0x^2 + 44.0x + 48.0}$
- D. $f(x) = \frac{x^3 + 18.0x^2 + 105.0x + 196.0}{x^3 - 12.0x^2 + 44.0x - 48.0}$
- E. None of the above are possible equations for the graph.
-

10. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{6x^3 + 31x^2 + 45x + 18}{2x^2 + 13x + 15}$$

- A. Horizontal Asymptote of $y = 3.0$ and Oblique Asymptote of $y = 3x - 4$
- B. Horizontal Asymptote at $y = -5.0$
- C. Horizontal Asymptote of $y = -5.0$ and Oblique Asymptote of $y = 3x - 4$
- D. Horizontal Asymptote of $y = 3.0$
- E. Oblique Asymptote of $y = 3x - 4$.
-

11. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{12x^3 + 83x^2 + 165x + 100}{6x^2 + 19x + 15}$$

- A. Holes at $x = -1.5$ and $x = -1.667$ with no vertical asymptotes.
- B. Vertical Asymptotes of $x = -1.5$ and $x = -1.667$ with no holes.
- C. Vertical Asymptote of $x = -1.5$ and hole at $x = -1.667$
- D. Vertical Asymptote of $x = 2.0$ and hole at $x = -1.667$
- E. Vertical Asymptotes of $x = -1.5$ and $x = -1.25$ with a hole at $x = -1.667$

12. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{12x^3 - 41x^2 - 40x + 48}{12x^2 - x - 6}$$

- A. Holes at $x = -0.667$ and $x = 0.75$ with no vertical asymptotes.
 - B. Vertical Asymptotes of $x = -0.667$ and $x = 0.75$ with no holes.
 - C. Vertical Asymptotes of $x = -0.667$ and $x = -1.333$ with a hole at $x = 0.75$
 - D. Vertical Asymptote of $x = -0.667$ and hole at $x = 0.75$
 - E. Vertical Asymptote of $x = 1.0$ and hole at $x = 0.75$
-

13. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{6x^3 - 5x^2 - 33x - 18}{6x^2 + x - 12}$$

- A. Vertical Asymptote of $x = 1.333$ and hole at $x = -1.5$
 - B. Holes at $x = 1.333$ and $x = -1.5$ with no vertical asymptotes.
 - C. Vertical Asymptote of $x = 1.0$ and hole at $x = -1.5$
 - D. Vertical Asymptotes of $x = 1.333$ and $x = -1.5$ with no holes.
 - E. Vertical Asymptotes of $x = 1.333$ and $x = -0.667$ with a hole at $x = -1.5$
-

14. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{4x^3 + 8x^2 - 27x - 45}{8x^2 + 2x - 15}$$

- A. Vertical Asymptotes of $x = 1.25$ and $x = 2.5$ with a hole at $x = -1.5$
- B. Vertical Asymptotes of $x = 1.25$ and $x = -1.5$ with no holes.

- C. Holes at $x = 1.25$ and $x = -1.5$ with no vertical asymptotes.
 - D. Vertical Asymptote of $x = 0.5$ and hole at $x = -1.5$
 - E. Vertical Asymptote of $x = 1.25$ and hole at $x = -1.5$
-

15. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{6x^3 + x^2 - 42x - 45}{3x^2 + 20x + 25}$$

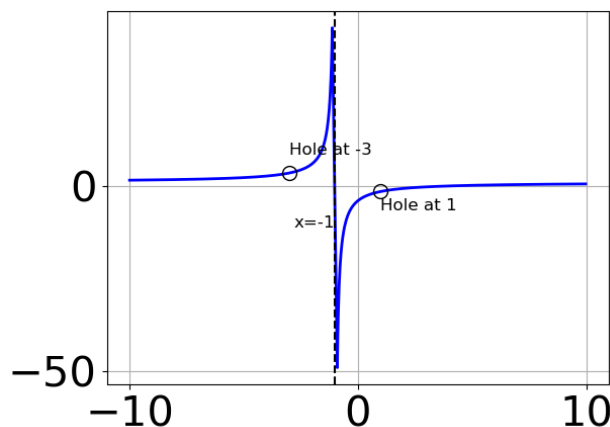
- A. Horizontal Asymptote of $y = -5.0$ and Oblique Asymptote of $y = 2x - 13$
 - B. Oblique Asymptote of $y = 2x - 13$.
 - C. Horizontal Asymptote at $y = -5.0$
 - D. Horizontal Asymptote of $y = 2.0$ and Oblique Asymptote of $y = 2x - 13$
 - E. Horizontal Asymptote of $y = 2.0$
-

16. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{6x^2 - 23x + 15}{24x^3 - 134x^2 + 167x - 60}$$

- A. Horizontal Asymptote of $y = 0.250$
 - B. Oblique Asymptote of $y = 4x - 7$.
 - C. Horizontal Asymptote of $y = 0$
 - D. Horizontal Asymptote at $y = 3.000$
 - E. Horizontal Asymptote of $y = 0.250$ and Oblique Asymptote of $y = 4x - 7$
-

17. Which of the following functions *could* be the graph below?



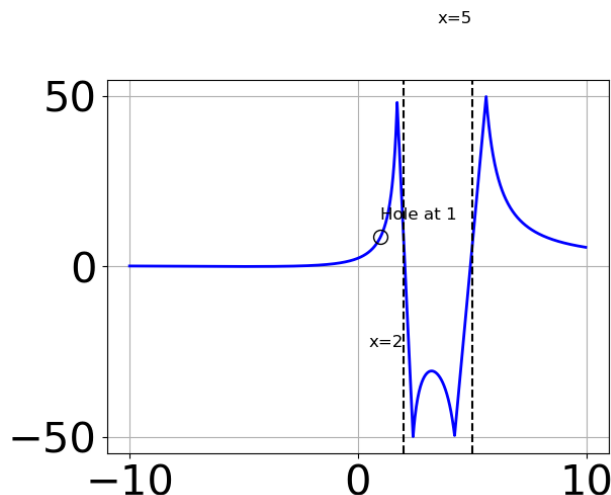
- A. $f(x) = \frac{x^3 + 6.0x^2 - 32.0}{x^3 - 3.0x^2 - x + 3.0}$
- B. $f(x) = \frac{x^3 + 2.0x^2 - 11.0x - 12.0}{x^3 - 3.0x^2 - x + 3.0}$
- C. $f(x) = \frac{x^3 - 2.0x^2 - 11.0x + 12.0}{x^3 + 3.0x^2 - x - 3.0}$
- D. $f(x) = \frac{x^3 - 4.0x^2 - 36.0x + 144.0}{x^3 + 3.0x^2 - x - 3.0}$
- E. None of the above are possible equations for the graph.

18. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{6x^2 - 25x - 25}{12x^3 + 40x^2 - 47x - 60}$$

- A. Oblique Asymptote of $y = 2x + 15$.
- B. Horizontal Asymptote of $y = 0$
- C. Horizontal Asymptote at $y = 5.000$
- D. Horizontal Asymptote of $y = 0.500$
- E. Horizontal Asymptote of $y = 0.500$ and Oblique Asymptote of $y = 2x + 15$

19. Which of the following functions *could* be the graph below?



- A. $f(x) = \frac{x^3 - 9.0x^2 + 14.0x + 24.0}{x^3 + 8.0x^2 + 17.0x + 10.0}$
- B. $f(x) = \frac{x^3 - 12.0x^2 + 44.0x - 48.0}{x^3 + 8.0x^2 + 17.0x + 10.0}$
- C. $f(x) = \frac{x^3 + 15.0x^2 + 74.0x + 120.0}{x^3 - 8.0x^2 + 17.0x - 10.0}$
- D. $f(x) = \frac{x^3 + 9.0x^2 + 14.0x - 24.0}{x^3 - 8.0x^2 + 17.0x - 10.0}$
- E. None of the above are possible equations for the graph.

20. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{8x^3 + 10x^2 - 13x - 15}{4x^2 - 21x + 20}$$

- A. Horizontal Asymptote of $y = 4.0$ and Oblique Asymptote of $y = 2x + 13$
- B. Horizontal Asymptote of $y = 2.0$ and Oblique Asymptote of $y = 2x + 13$
- C. Horizontal Asymptote at $y = 4.0$
- D. Oblique Asymptote of $y = 2x + 13$.

E. Horizontal Asymptote of $y = 2.0$

21. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{8x^3 + 26x^2 - 33x - 36}{16x^2 - 8x - 15}$$

- A. Vertical Asymptotes of $x = 1.25$ and $x = -0.75$ with no holes.
 - B. Vertical Asymptotes of $x = 1.25$ and $x = 1.5$ with a hole at $x = -0.75$
 - C. Vertical Asymptote of $x = 0.5$ and hole at $x = -0.75$
 - D. Holes at $x = 1.25$ and $x = -0.75$ with no vertical asymptotes.
 - E. Vertical Asymptote of $x = 1.25$ and hole at $x = -0.75$
-

22. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{12x^3 + 11x^2 - 45x - 50}{6x^2 + x - 15}$$

- A. Holes at $x = 1.5$ and $x = -1.667$ with no vertical asymptotes.
 - B. Vertical Asymptote of $x = 1.5$ and hole at $x = -1.667$
 - C. Vertical Asymptotes of $x = 1.5$ and $x = -1.667$ with no holes.
 - D. Vertical Asymptote of $x = 2.0$ and hole at $x = -1.667$
 - E. Vertical Asymptotes of $x = 1.5$ and $x = -1.25$ with a hole at $x = -1.667$
-

23. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{12x^3 + 17x^2 - 14x - 15}{12x^2 + x - 6}$$

- A. Vertical Asymptotes of $x = 0.667$ and $x = -0.75$ with no holes.
- B. Vertical Asymptote of $x = 1.0$ and hole at $x = -0.75$

- C. Vertical Asymptote of $x = 0.667$ and hole at $x = -0.75$
 - D. Vertical Asymptotes of $x = 0.667$ and $x = -1.667$ with a hole at $x = -0.75$
 - E. Holes at $x = 0.667$ and $x = -0.75$ with no vertical asymptotes.
-

24. Determine the vertical asymptotes and holes in the rational function below.

$$f(x) = \frac{8x^3 + 18x^2 - 15x - 25}{12x^2 - 31x + 20}$$

- A. Vertical Asymptotes of $x = 1.333$ and $x = -2.5$ with a hole at $x = 1.25$
 - B. Vertical Asymptotes of $x = 1.333$ and $x = 1.25$ with no holes.
 - C. Holes at $x = 1.333$ and $x = 1.25$ with no vertical asymptotes.
 - D. Vertical Asymptote of $x = 0.667$ and hole at $x = 1.25$
 - E. Vertical Asymptote of $x = 1.333$ and hole at $x = 1.25$
-

25. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{12x^3 + 25x^2 - 4x - 12}{4x^2 + 23x + 15}$$

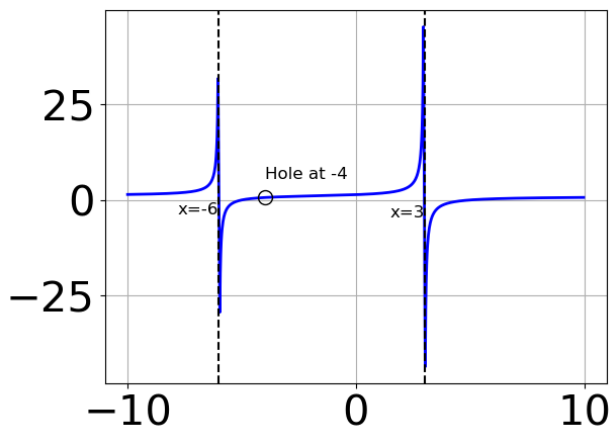
- A. Oblique Asymptote of $y = 3x - 11$.
 - B. Horizontal Asymptote of $y = 3.0$
 - C. Horizontal Asymptote of $y = 3.0$ and Oblique Asymptote of $y = 3x - 11$
 - D. Horizontal Asymptote of $y = -5.0$ and Oblique Asymptote of $y = 3x - 11$
 - E. Horizontal Asymptote at $y = -5.0$
-

26. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{12x^3 + 83x^2 + 165x + 100}{3x^3 - 5x^2 - 65x - 100}$$

- A. Vertical Asymptote of $y = -4$
- B. None of the above
- C. Horizontal Asymptote of $y = 0$
- D. Horizontal Asymptote of $y = 4.000$
- E. Vertical Asymptote of $y = 5.000$

-
27. Which of the following functions *could* be the graph below?



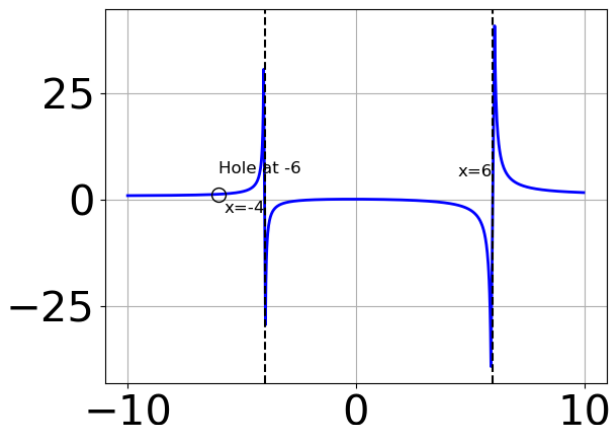
- A. $f(x) = \frac{x^3 - 5.0x^2 - 25.0x + 125.0}{x^3 - 7.0x^2 - 6.0x + 72.0}$
- B. $f(x) = \frac{x^3 - 5.0x^2 - 25.0x + 125.0}{x^3 + 7.0x^2 - 6.0x - 72.0}$
- C. $f(x) = \frac{x^3 + 4.0x^2 - 25.0x - 100.0}{x^3 + 7.0x^2 - 6.0x - 72.0}$
- D. $f(x) = \frac{x^3 - 4.0x^2 - 25.0x + 100.0}{x^3 - 7.0x^2 - 6.0x + 72.0}$
- E. None of the above are possible equations for the graph.

28. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{5x^2 + 27x + 10}{15x^3 + x^2 - 12x - 4}$$

- A. Horizontal Asymptote of $y = 0.333$ and Oblique Asymptote of $y = 3x - 16$
 - B. Horizontal Asymptote at $y = -5.000$
 - C. Horizontal Asymptote of $y = 0$
 - D. Oblique Asymptote of $y = 3x - 16$.
 - E. Horizontal Asymptote of $y = 0.333$
-

29. Which of the following functions *could* be the graph below?



- A. $f(x) = \frac{x^3 - 2.0x^2 - 4.0x + 8.0}{x^3 - 4.0x^2 - 36.0x + 144.0}$
 - B. $f(x) = \frac{x^3 - 6.0x^2 - 4.0x + 24.0}{x^3 - 4.0x^2 - 36.0x + 144.0}$
 - C. $f(x) = \frac{x^3 + 6.0x^2 - 4.0x - 24.0}{x^3 + 4.0x^2 - 36.0x - 144.0}$
 - D. $f(x) = \frac{x^3 + 3.0x^2 - 4.0x - 12.0}{x^3 + 4.0x^2 - 36.0x - 144.0}$
 - E. None of the above are possible equations for the graph.
-

30. Determine the horizontal and/or oblique asymptotes in the rational function below.

$$f(x) = \frac{4x^3 - 8x^2 - 25x + 50}{2x^2 - x - 10}$$

- A. Horizontal Asymptote of $y = 2.0$
 - B. Horizontal Asymptote of $y = -2.0$ and Oblique Asymptote of $y = 2x - 3$
 - C. Horizontal Asymptote of $y = 2.0$ and Oblique Asymptote of $y = 2x - 3$
 - D. Oblique Asymptote of $y = 2x - 3$.
 - E. Horizontal Asymptote at $y = -2.0$
-